

The assessment team would like to thank all of the Shoshone County residents that participated in this survey.

## **Fire Fighting Responsibilities in Shoshone County**

A separate document titled “Shoshone County Fire Fighting Resources and Capabilities: Rural and Wildland” has been prepared. This document details the location of each fire district in the county, where fire stations are located, and the resources available to fight structure fires. In addition it details the wildland fire responsibilities in the county and resources for fighting those types of fires. Maps of the coverage of each district (rural and wildland) are provided with additional statistics on each district.

## **Fire Hazard Analysis: A Three Stage Approach**

In order to assess the fire risk in areas of the county, we have developed and implemented a three-stage analysis. The first stage assesses the potential of a fire to start in any given area based on where fires have started historically in the county. The second stage determines where the highest risk areas are located in terms of potential fire spread. To determine fire spread, we evaluated the factors of slope, aspect, weather conditions, plant cover type, absence of riparian zones, and other related factors that contribute to the rate of spread after fire ignition. Stage I estimates where fires are likely to start while stage II predicts how rapidly and in what direction a fire ignition will spread across the landscape. Stage III of the assessment determines where homes are located in the county. The location of these homes are then identified in relation to these highest risk areas. This helps to determine where the greatest potential exists for casualty loss due to fire spread. These factors are then all considered in selecting priority sites where fire mitigation projects should be implemented within Shoshone County. Each of these stages will be discussed in detail in the following sections.

### **Stage I: Predicting Where Fires Are Likely to Ignite**

The Idaho Department of Lands maintains detailed records on fire ignition points in the state of Idaho. Data on wildfire starts in Shoshone County was selected from the Idaho

Department of Lands database for the years 1983–1998 (IDL 2001). During this period, approximately 400 forest fires were recorded in the county. Site data from the ignition point on each fire was evaluated to determine where and when fire starts occurred. A Geographic Information System (GIS) analysis was conducted to determine what characteristics these points shared in an effort to map other areas that share similar characteristics.

While approximately 64% of all wildfires in Idaho start from lightning, only 57.9% of the fires in Shoshone County were started this manner during the analysis period. Debris burning in the county accounts for 7.3% of fire ignition with camping accounting for an additional 6.5% of fire starts. Smoking accounts for 4.8%, equipment use for 4.5%, and arson for 4.5%. Children playing with fire contributed to 4.3% of the fires in the county while the remaining 12.5% of fire starts in the county were attributable to miscellaneous causes.

As expected, most fires in the county were started during the summer and early fall months, as follows: June 14%, July 29%, August 31%, September 14%, and October 6%. Three-quarters (74.7%) of all forest fires in Shoshone County during the period 1983–1998 were contained at under a quarter of an acre. Fires growing larger than this amount were generally contained at under 10 acres (23.6% of the total). Less than 2% of all fires (by count—not acres) grew larger than 10 acres in Shoshone County during this time, with one fire reaching 1,438 acres in 1986.

Further analysis of fire ignition sources in Shoshone County were less than intuitive in terms of slope, aspect, and elevation of fire starts during the analysis period. For example, the highest occurrence of fire starts was observed not on southerly or westerly aspects as expected, but on northwestern aspects (16.5%). Although these aspects are generally the sites with more moisture on the landscape, they experienced the highest initial fire ignition frequency. Southwestern aspects ranked second (14.2%), with western aspects third (13.8%), respectively, in rank of wildfire ignition location. Northern aspects the wettest aspect, represented the fourth highest (12.7%) fire ignition occurrence rate. Southeastern aspects ranked fifth (12.3%), and southern aspects

ranked sixth (10.8%) in this classification. Northeast and eastern aspects experienced the lowest ignition rates with each accounting for approximately 8.6% of all fire starts in the county.

Slope is a measure of the steepness in a landscape. Generally, the steeper the slope the higher the fire spread risk. Steep slopes provide a rapid spread potential coupled with the most difficult areas to access and protect. However, historic fire occurrence records indicate that the flattest slopes (0–15%) accounted for 46% of all fire starts in the county from 1983–1998. Slopes from 15% to 25% accounted for eighteen percent of the ignition points. Slopes of 25% to 35% accounted for sixteen percent of the ignition points. Slopes 35% to 45% accounted for eleven percent of the ignition points and 45% to 55% slopes accounted for only four percent of the ignition points. Slopes greater than 55% accounted for five percent of the fire ignition points in the county. It should be noted that slopes over 45% in the county are not widely represented in comparison to the flatter slopes.

Over a third of the fires (39%) during the evaluation period were ignited between 2,000 and 3,000 feet elevation. One-quarter of the fires (25%) in the county ignited at elevations between 3,000 and 4,000 feet. Approximately 22% of the fires in the county ignited between 4,000 and 5,000 feet, with the remaining 14% of the fires igniting at elevations above 5,000 feet. It should be noted that the variation in ignition rates was not significantly different between 3,000 and 5,000 (22-25%) feet elevation. However, the number of fires igniting below 3,000 feet (39%) was significantly higher than expected.

Many of the historic fire occurrence factors were not what would be anticipated in predicting fire ignition locations in a forested ecosystem. However, an evaluation of these factors is useful. The data would indicate that the most common location of wildfire ignition was observed on northwest aspects with a flat slope (0–15%), below 3,000 feet elevation during the month of August. These locations define the prime camping locations, vacation cabins, and home sites throughout the region. Considering the fact that 6.5% of the fires in the county were started from careless campers, 7.3% of

the fire ignitions from debris burning, 4.8% from smoking related ignition, and 4.3% from careless children (22.9% all combined), these locale would be considered high risk fire ignition points.

In addition, it should be noted that ridge tops also have what would be considered seemingly level slopes. These points on the landscape were common locations where lightning ignited fires were observed. When combined, human carelessness and lightning caused fires accounted for the overwhelming majority of fire starts (81%).

The landscape features corresponding to the highest occurrence of historic fire point ignition sources has been mapped across the entire landscape of Shoshone County. This is not a map of past fire ignition points, but a map of where the landscape has the characteristics common to past ignition points. These are useful in identifying where the highest risk of fire occurrence is located.

## **Stage II: Determining Highest Risk Landscapes for Fire Spread**

A geospatial analysis, using GIS, has been conducted to predict those areas of Shoshone County which have the greatest potential for fire spread once a fire has ignited in the vicinity. A number of factors were considered in developing the model including aspect, slope, juxtaposition to streams and lakes, and cover vegetation. In this model, these factors were combined to select high risk areas in the following ways:

- More than 150 feet from the nearest flowing water source (non-riparian)
- Aspect of southerly or westerly
- Vegetation cover equal to high risk plant communities (see Appendix II for descriptions)

The conditions were then selected in classes of slope from a minimum of 0% to a maximum of 90%. This was done in 10% increments. The result is an index of potential fire risk displayed on the fire risk assessment map of the county in shades from yellow to bright red (low risk (yellow) to high risk (red)). As the slope increases, the estimated fire risk increases as well. As expected, steep southerly and westerly slopes covered

with dry-site forest tree species dominate the highest predicted risk areas (Appendix II descriptions).

Approximately 18.3% of the area of the county was assessed in one of these 9 categories of risk for the spread of a wildfire. These are the areas that represent the greatest challenge to protect in the case of a wildfire.

On the landscape level, large fires have spread to the northwest after ignition. Although these fires will tend to race uphill and backdown hills, the general direction of fire spread is to the northwest (see attached maps).

### **Stage III: Identifying Communities and Concentrations of Dwellings**

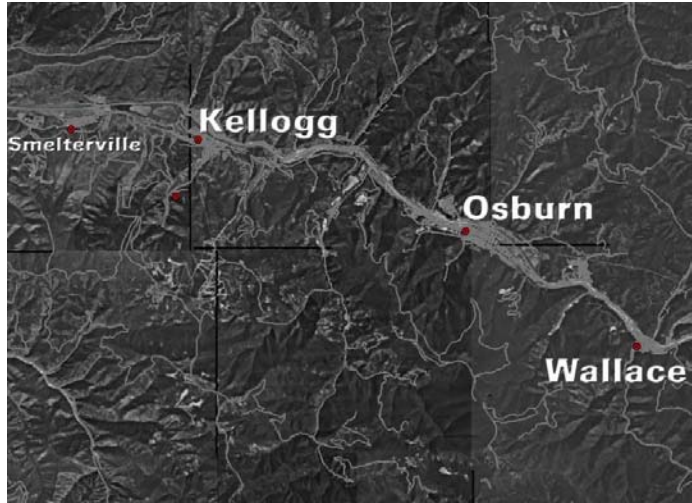
In order to identify communities in Shoshone County, data from the US Census of 2000 was used and augmented with local information on where people in Shoshone County live. Initially, community clusters were identified as named communities with a population of at least 50 persons. The community of Prichard did not meet this standard but was added to the list of communities based on observations on the number of homes found there. Around these selected communities a 3 mile circular zone was created to identify the area of greatest concern from wildfire spread. These community clusters include:

- Prichard–Eagle–Murray
- Western I-90 Corridor: Enaville–Kingston–Pinehurst–Smelterville–Kellogg–Wardner
- Eastern I-90 Corridor: Osburn–Wallace–Bunn–Gem–Mace–Burke–Mullan
- Avery
- Calder
- Clarkia

The I-90 corridor of buildings is actually continuous, but was separated into two groups for the purposes of this analysis.

Ortho-photos are photographs of the earth's surface from the vantage point of space. US Government satellites record images of the earth in a sun synchronous orbit that record images of the entire planet about every 4 days. Ortho-photo quarter quads were

translated into a usable GIS format and assembled for the entire area of Shoshone County. Each image was optically and visually scanned (so-called “heads-up digitizing”) for evidence of home sites, buildings, and industrial complexes. These building locations were recorded on a GIS point layer of building sites in Shoshone County. Once completed, the data layer included over 5,600 building locations. It is evident that this layer of information contains more than just homes, but also includes garages, businesses, and factories: occupied and unoccupied. However, the data layer is not perfect. The layer contains some errors, such as indications of building locations where none exists, and actual building locations that were not mapped. These occurrences were due to a variety of reasons; heavy vegetation that obscured roof tops from overhead view, roof tops with vegetation growing on them, large container truck vans parked in home site areas (mistaken for metal roofs of mobile homes), and piles of sheet metal mistaken for roof tops, only to name a few. These errors do not significantly affect the analysis since the addition or omission of several buildings does not influence where the home site concentrations are located.



Analysis of these building locations was further conducted to assess the degree of concentration of buildings in the county. The analysis followed a methodology that assigns a physical location to each building site and then calculates the distance to every other building location in its cluster to determine the “average” building location in each cluster of buildings. The distance from each building to the closest core or center concentration of buildings produces a density index. The analysis determined physical boundaries of where the highest concentration of 95% of the building locations in the county was found. It is no surprise that the greatest majority of building locations were found along the I-90 corridor. Additional concentrations were found in the remote

communities of the county where the concentrations of buildings were the highest (eg. Avery). See attached maps for examples.

While the previous analysis demonstrates where the majority of the building locations are to be found, a second analysis layer may be more useful for identifying where fire mitigation efforts will be the most effective. This additional analysis layer depicts a continuous zone extending 1 mile from each building location in the county. While many of the homes in the large communities (e.g., Kellogg, Wallace, Pinehurst) are highly concentrated, the second analysis for these communities is only concerned with the outer perimeter of buildings creating a one mile zone from these home sites, with no implications for building concentrations.

This second analysis layer has been clipped by the community buffer layer. This produced an interesting map layer that showed not only where communities are located but where the residents of each community are located: 3 miles around each community and 1 mile from each building in that community. This map layer was useful in identifying the highest risk areas and to focus attention when conducting forest fire mitigation projects.

### **Identifying Target Areas**

Using the map layers identified in the three stages of analysis, it was possible to identify the home site areas where fuel mitigation efforts should be targeted. This information was used to meet the project's goal of reducing the rate of spread, treating fuels, and reducing the area of land burned by forest fires in Shoshone County. To better identify these areas, a GIS analysis was again applied to locate those areas that met all of the following criteria:

- Within a community cluster area (3 mile radius of an identified community)
- Within a home site/building location zone (1 mile cluster from all buildings)
- Within 300 feet of an area identified at high risk to fire ignition
- Areas within 300 feet of one of the 9 slope risk categories for fire spread hazard

Locations that meet all four criteria are considered to be at high risk for ignition of a fire, a rapid spread of that fire, and possess the potential to cause significant casualty loss to multiple homeowners when it happens. Maps of each community cluster are included and identify where these highest risk areas are located.

Forestlands outside this zone were also evaluated and will be summarized in a separate section of this report.

## **Risk Assessment and Fire Mitigation Projects**

### **Community Level**

All of the communities of Shoshone County and much of the critical lands surrounding communities were visited during the summer of 2002 by Northwest Management, Inc., personnel to assess the fire risk, the risk of casualty loss due to wildfire, the potential for effective mitigation efforts, and cost effectiveness. Input from local citizens, fire district personnel, wildfire specialists, and others was incorporated into these recommendations. Specialists from the US Forest Service, the Bureau of Land Management, the Idaho Department of Lands, and Shoshone Fire Districts 1 & 2 provided valuable time, information, and input to this analysis.

The cost of mitigation treatments is highly variable and will require extensive efforts to complete. However, we have summarized a wide range of treatment options and the approximate cost of those treatments in a separate document. Cost estimates from the specific community assessments can be combined to determine approximate costs of project implementation.

### **Characteristics of a Defendable Home**

At the community level, individual home sites were evaluated for their characteristics to resist ignition during a wildfire. Defendable home sites have many factors in common:

- 100 foot buffer between buildings and the forest
- nonflammable roofing material
- nonflammable decking material